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1- Enviromental impact assessment (EIA), (EIIA)

* Enviromental assessment: It is a procedure that ensures that the environmental implications of decisions are taken into account before decisions are made i.e. predicts environmental consequences of proposed development activities
- (EA) is for projects, plans, programmers & policies
- Environmental factors → Soil contamination impacts
  → Air pollution impacts
  → Noise health effects
  → Ecology impacts
  → Geological hazards assessement
  → water pollution impacts
- (EIA) predicts specific action to environment as incentives or legislations

* The EIA seven keys areas:

1- Description of the project:
- Description of actual project & site
- Break the project down to its key components as construction, operation
- For each component, list the sources of environmental disturbance, inputs and outputs

2- Alternatives that have been considered:
- Examine alternatives that have been considered as Cairo airport or Alex airport

3- Description of the environment:
- List all aspects of environment affected by development as soil
- By experts

4- Description of the significant effects on the environment:
- It is related to the main processes involved as effect of wind firm on birds

5- Mitigation: تخفيف التأثير
- It is the most useful thing for (EIA)
- Using the 4 previous things to develop the project to be suitable for environment (least impact) as changing place of wind firm out of bird nesting seasons

6- Non-technical summary:
- To be available to the public

7- Lack of know-how/technical difficulties:
- It is used to focus on area of weakness i.e. area of future research

*(EIA) objectives:
1- Predicts environmental impact of projects
2- Find means to reduce adverse impacts
3- Shape the project to suite local environment
4- Present the predictions & options to decision-makers

*- Strategic environmental assessment (SEA) is a system of incorporating environmental considerations into polices, plan & programs they are related to Strategic environmental impact assessment
- (SEA) is used in (EIA)

* SEA structure:

1- Screening: Investigating plan/program under SEA legislation
2- Scoping: Defining boundries of investigation, assessment & alternatives
3- Documentation of environment state: To be baseline for
4- Determination of likely (non-marginal) environmental impacts
5- Informing & consulting the public
6- Influencing "decision making"
7- Monitoring effects of plans & programs after implementation

2_Noise impacts

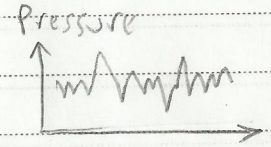
* - Noise contours and analyses are generated by Integrated Noise Calculation Model (INM)
  - For flight tracks Automated Radar Terminal System (ARTS) is used

* - Sound pressure level: It is the level of sound wave which affects the surrounding $SPL = 20 \log\left(\frac{P_{rms}}{P_{ref.}}\right)$ [dB]
  - Weighted Sound pressure level: It is the level of sound wave which the ear responds to it dBA < SPL
  - Equivalent Continuous noise level ($L_{Aeq.}$): It is the equivalent level of sound level which the ear responds for certain period of time
  - Maximum sound pressure level ($L_{Amax.}$): It is the max. instantaneous level which the ear responds during certain period
  - Minimum sound pressure level ($L_{Amin.}$): It is the min. instantaneous level which the ear responds during certain period
  - L_{A10} L_{A50} L_{A90}: It is A-weighted sound levels which are exceeded for (10-50-90)% of the measuring period
  - Daily Night Sound level (DNL): It is the sound level day/night

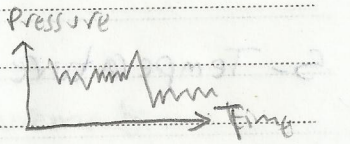
* - Audiable sound pressure (w.r.t. 10^5 Pa) = 20 μPa : 100Pa

* Types of noises:

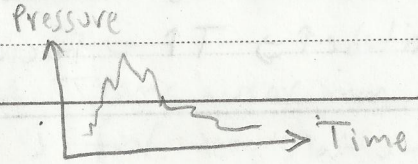
1- Continuous noise:



2- Intermittent noise: For period of time as airplanes



3- Implusive noise:



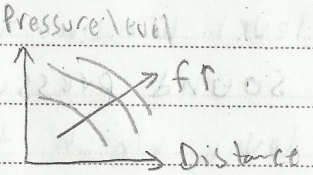
* Perception of sound:

- By increase/decrease of sound level by 1dB → Just noticeable
  3dB → Noticeable (PPT)
  6dB → Obvious
  10dB → Significant

* Effects on noise propagation:

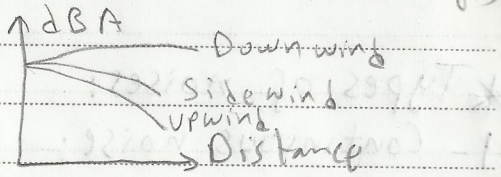
1- Type of source:
   A- Point: source dimensions are small w.r.t. distance travelled to receiver
   B- Line: source is narrow in one direction & long in other
      1- Single as pipe
      2- Many point sources as road

2- Distance from source:



3- Atmospheric absorption:

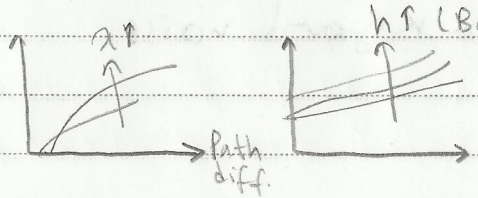
4- Wind: Altitude↑ ⇒ wind speed↑ ⇒ Bend path at which it sound is focused at downwind side & shadow at upwind side (increase is small and decrease is large)



5- Temperature: As wind but uniform
   Altitude↑ ⇒ T↓ ⇒ shadow effect → [sunny day]
   Altitude↑ ⇒ T↑ ⇒ Focus [clear night]

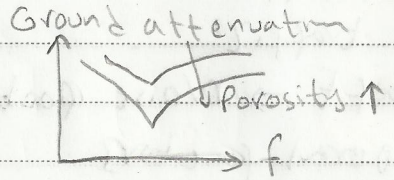
6- Obstacles: Barries & buildings

$\Delta dB_{barrier} = f$(Path diff. of sound wave, Frequency content of noise)



Barrier → Shape
→ Material
→ Thickness

7- Ground absorption: Reflected sound interferes with the propagated sound ⇒ sound level increases



8- Reflections: On impact of sound wave with surface, some are reflected, other are transmitted and other are absorbed

9- Humidity: ↑ ⇒ Propagation↓

10- Precipitation

* Noise measuring:

- Noise assessment is about evaluating impact of a specific noise source

- Types of noises:

1- Ambient noise
2- Specific noise
3- Residual noise

* Calibration:

- Calibration is before & after series of measurements

- Reasons for calibration:

- To prevent lost work (Transducer may be fault)
- Calibration data is for legislation & std,

* Types of noises limits:
1- Absolute: Relative to fixed value of 50 dB(A)
2- Relative: Relative to Background noise

* Types of noises:
- Industrial
- Road traffic
- Rail traffic
- Aircraft ⇒ Noise footprints for noise contours depending on several factors

* Measurement report:
Source model Noise propagation model Noise level at receiver

* Noise reduction: source, path & receiver

3- Tourist environmental impacts

* - Tourist develops the surrounding area f should be studied
  1- Number of tourists f expected increase
  2- Tourist permanent impact as airport surrounding enviorment
  3- Tourist impact on airport infrastructure
  4 Tourist direct f indirect impact on the airport development f surr. environment

* Water quality:
- Historical data for surface water f groundwater should be collected to evaluate the project
- Water quality is described physically, chemically f biologically
- Storm (flood) water management system should be described as well as mechanisms of mitigation

* cultural resources:
- Historic, architectural, archaeological f cultural resources in project area should be described

* Biological resources:
- For biotic communities

* Energy use:
- Energy use Should be documented for flight operations as ground support equipment, natural gas, etc. qualitatively f quantitively

* Solid f Hazardous waste
* Vehicular traffic f access to the airport
* Erosion f sediment
* Social impacts

4- Air pollution

* Classification of pollutants:
1- Criteria pollutants
2- Air toxics
3- Ozone depleting substances (ODSs)
4- Greenhouse gasses (GHGs)
5- Visibility degrading pollutants
6- Photochemical smog - ozone
7- HAPs

* - Ambient air: Air in troposphere to breathe and has certain properties
- Clean air: Nitrogen 78%
Oxygen 21%
Argon 0.9%
Other 0.1%
- Carbon dioxide 330 ppm
- Ne 18 ppm
- He 5 ppm
- CH_4 1.5 ppm
- other gasses 1 ppm
- Air pollution: Presence of definite substances in air in concentrations which cause health & environmental problems
Sources: Naturally occuring / Man-made (stationary/mobile)
Composition: Gasses, water droplets & particles

- Air pollutant: It is a visible/invisible particle or gas found in air and not a part of natural air

- Air pollution depends on external conditions as wind which causes its dispersion [Dispersion]
- Natural substances & air pollutants react with each other to form different compounds [Transformation]
- Pollutants deposite
- Pollutants evaporate

- Sources: Man-made → stationary (Indoors / Outdoors)
  → mobile (On road / Non road)
  Natural → Plants & soils
  → Lightning, volcanoes & wildfires

- Half life time (Between source & sink) depends on deposition, suspension & reentrainment of pollutant

- PPm → Gaseous pollutants
  $\mu g/m^3$ → Particulates & gaseous pollutants
  $\mu g/m^3$ = PPm × 40.9 × mol. weight of pollutant (MW)

* PM (Particulate matters) Effect:
  1- Reduction of visual range
  2- Formation of acid rains (SO_2 & NOx)
  3- Serious health problems
  4- Environmental damage
- PM → SO_x, NO_x, VOC & NH_3
-

* Environmental effects of air pollution:

1- Photochemical smog:

- O_3 is formed when NO_x, VOC & other pollutants emitted by cars react in the presence of sunlight

- Effects of smog:
  - A- Reduced lung function
  - B- Damages vegetation
  - C- Reduced visability

2- Global warming:

- By Greenhouse gasses (GHG_s) CO_2, CH_4 & N_2O in which heat is trapped causing rise of earth temp.

- Effects:
  - Regional climate change human health, forest & water supply level

* Types of pollutants:

1- Primary: Emitted directly from a source as CO, N_2O, Pb, SO_2, PM, VOC (volatile organic compounds) & NH_3

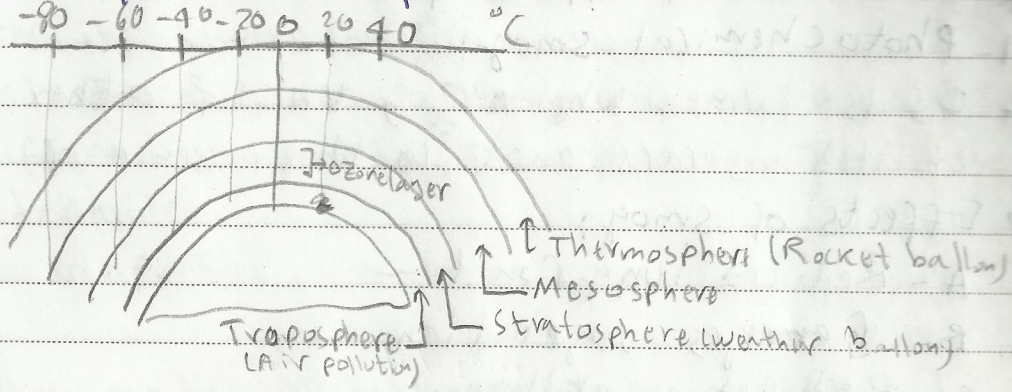
2- Secondary: Formed in atm. as O_3, NO_2, PM & formaldehyde

3- Both

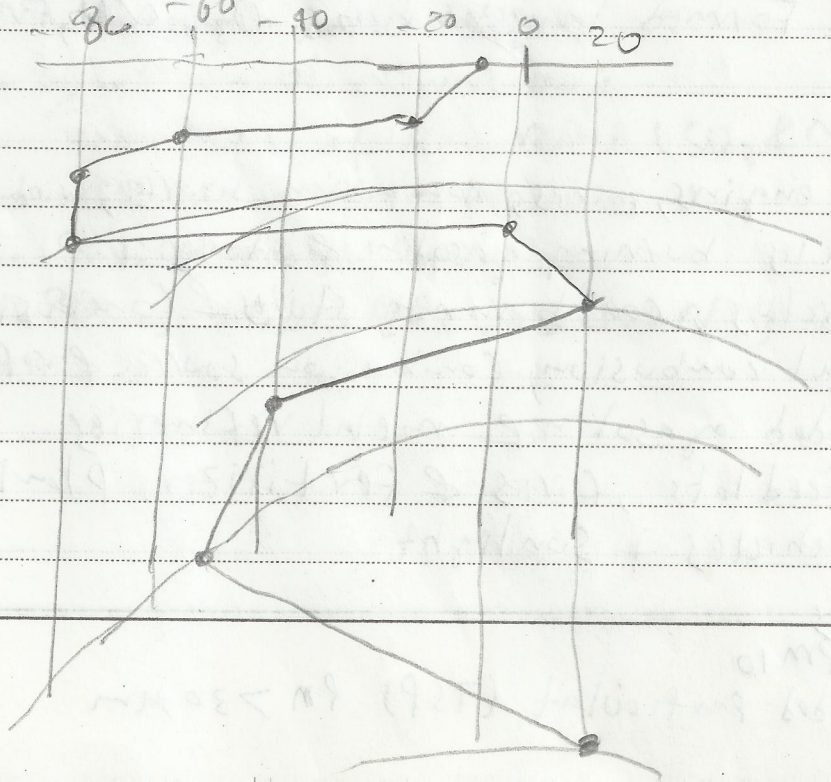
*- PM: Diesel engines, mines, combustion source, wind blown dust, etc
CO: Vehicles burning gasoline & stoves
NO_x: Vehicles, coal burning stoves & combustion sources
SO_2: Coal combustion, combustion sources & refineries
Pb: Leaded gasoline & metal refineries
NH_3: Feedlots, fires & fertilizer plants
O_3: Vehicles + Sunlight

- Fine $PM_{2.5}$
Respirable PM_{10}
Total suspended particulat (TSP) PM > 30 μm

* Major regions of the atmosphere



1- Troposphere:
Provides O_2 to humans mainly
Provides CO_2 to plants
Transports water by precipitation
Serves as medium for sound

2- Stratosphere:
Provides heat near earth's surface
Shields earth from harmful radiation

3- Thermosphere
Make long distance communication possible